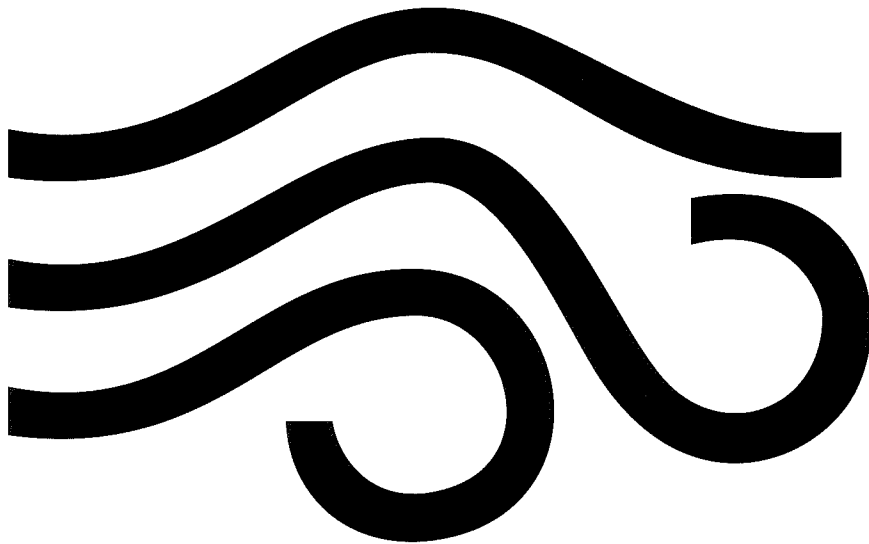


FINAL EVALUATION REPORT
END USE ALTERNATIVES FOR REMEDIATED GROUNDWATER

OPERABLE UNIT 1 (OU1)
MOTOROLA 52ND STREET SUPERFUND SITE



Prepared for:
Freescale Semiconductor, Inc.

Prepared by:
Clear Creek Associates, PLC

December 22, 2010



*Practical Solutions
in Groundwater Science*

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December 22, 2010

Ms. Wendy Flood
Remedial Project Manager
Arizona Department of Environmental Quality
1110 W. Washington Street
Phoenix, AZ 85007

**Re: Final Evaluation Report
End Use Alternatives for Remediated Groundwater
Operable Unit 1
Motorola 52nd Street Superfund Site**

Dear Ms. Flood:

On behalf of Freescale Semiconductor, Inc., (Freescale), Clear Creek Associates PLC (Clear Creek) is forwarding the enclosed copy of the *Final Evaluation Report, End Use Alternatives for Remediated Groundwater, Operable Unit 1, Motorola 52nd Street Superfund Site*. The report, prepared for Freescale by Clear Creek Associates, evaluated the two remaining end use alternatives – injection and discharge to the Grand Canal via direct discharge to the Old Crosscut Canal (OCC). Both of these alternatives would provide a long-term beneficial end use of the treated groundwater from the Operable Unit 1 (OU1) remedy. However, the analysis indicates that there are significant advantages to the OCC Discharge Alternative over the injection alternative. These benefits include:

- A higher probability of successfully securing the access and permit approvals necessary to implement;
- Fewer disruptions to the local neighborhoods, streets and highways;
- Significantly reduced implementation (including both permitting and construction) time frames;

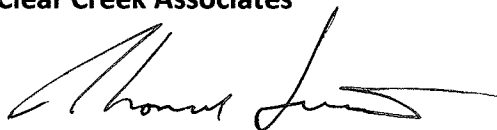
- Faster transition from the temporary sanitary sewer discharge;
- Improved operational reliability; and
- Significantly lower cost.

Based on this analysis, Freescale proposes discharging to the Grand Canal via direct discharge to the OCC as its preferred alternative using the pipeline along 50th & Culver Streets/Brunson-Lee Elementary School to OCC alignment for long-term use of the treated groundwater generated by the OU1 groundwater remedy. The previously approved COP sanitary sewer discharge would be used as a backup for discharge during maintenance and canal dry-up periods.

Please feel free to contact the undersigned or Jenn McCall at Freescale if you have any questions.

Sincerely,

Clear Creek Associates



Thomas R. Suriano, R.G.
Principal Hydrogeologist

cc: Jenn McCall – Freescale Semiconductor, Inc.
Sherri Zendri – ADEQ
Wayne Miller – ADEQ
Scott Miller – ADWR
Martin Zeleznik – EPA
Phil McNeely – City of Phoenix
Karol Wolf – SRP
Sharen Meade – Clear Creek Associates
Steve Whillier – Conestoga-Rovers & Associates
Mary Moore – Lindon Park TAG
Mario Casteneda – Lindon Park TAG Advisor

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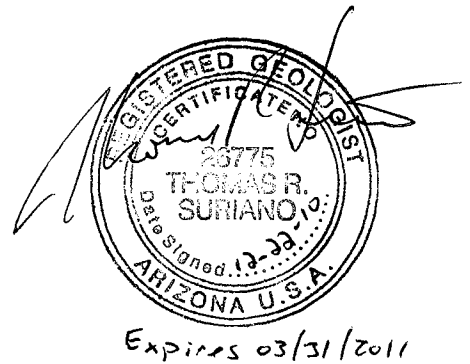


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LIST OF ACRONYMS AND ABBREVIATIONS

ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AgI	agricultural irrigation standard
APP	Aquifer Protection Permit
AZPDES	Arizona Pollution Discharge Elimination System program
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Clear Creek	Clear Creek Associates, PLC
COP	City of Phoenix
CRA	Conestoga-Rovers & Associates
EPA	US Environmental Protection Agency
ESD	Explanation of Significant Differences
FCDMC	Flood Control District of Maricopa County
Freescale	Freescale Semiconductor, Inc.
gpm	gallons per minute
GRAA	Groundwater Remedial Alternatives Analysis
IGA	Intergovernmental Agreement
IGWTP	Integrated Groundwater Treatment Plant
LOD	Letter of Determination
MCL	maximum contaminant level
mg/L	milligrams per liter
msl	mean sea level
OCC	Old Crosscut Canal
OU1	Operable Unit No. 1
PQGWWP	Poor Quality Groundwater Withdrawal Permit
ROD	Record of Decision
SR 143	State Route 143
SR 202	State Route Loop 202 Red Mountain Freeway
SRP	Salt River Project
SWPL	Southwest Parking Lot (at the 52nd Street Facility)
ug/l or ug/L	micrograms per liter
UIC	Underground Injection Control
US	United States
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

This report presents the final evaluation by Freescale Semiconductor, Inc. (Freescale) of alternative long-term end use alternatives for the remediated groundwater generated by the Operable Unit 1 (OU1) treatment system at the 52nd Street Superfund Site in preparation for ON Semiconductor's discontinuation of manufacturing operations at its 52nd Street facility. This report also presents the current status of ON Semiconductor's projected cessation of manufacturing operations at the facility and status of construction of the short-term discharge option to the City of Phoenix (COP) sanitary sewer previously approved by the Arizona Department of Environmental Quality (ADEQ) in its July 14, 2009 letter to Freescale.

As noted in prior correspondence with ADEQ, certain options for the use of the treated remediation water identified in the preliminary screening effort were eliminated from further consideration. These include delivery to the Papago Park golf course for turf irrigation, discharge to the Crosscut Canal via a pipeline constructed along McDowell Road through the Papago Buttes, and direct discharge to the Grand Canal. As discussed in the April 30, 2010 Revised Evaluation (Clear Creek Associates, 2010), the September 7, 2010 and June 10, 2009 letter updates (Freescale Semiconductor, Inc., 2009 and 2010) to ADEQ, the limited benefits of these options were far outweighed by the logistical and/or regulatory difficulties in implementing them. The remaining alternatives still under consideration for the long-term discharge of treated water from the OU1 groundwater treatment facility are injection into the aquifer and discharge to the Grand Canal for irrigation use via a direct discharge to the Old Crosscut Canal (OCC) (see Figure 1).

The purpose of this report is to: 1) provide an update on the status of the ADEQ-approved short-term discharge to the COP sanitary sewer; and 2) evaluate the remaining two long-term discharge alternatives. The remainder of the report is organized as follows:

- Section 2 – provides an update on the status of the ADEQ-approved short-term discharge option of discharge to the COP sanitary sewer;
- Section 3 – describes the evaluation of the long-term discharge alternative involving injection of treated water to the aquifer;

- Section 4 – describes the evaluation of the long-term discharge of treated water to the Grand Canal via direct discharge to the OCC (including an evaluation of two possible pipeline alignments); and
- Section 5 – identifies Freescale’s preferred long-term discharge alternative.

2.0 ADEQ-APPROVED DISCHARGE TO THE CITY OF PHOENIX SEWER

ON Semiconductor informed Freescale that it plans to discontinue manufacturing operations at the 52nd Street facility in the second quarter of 2011. ON Semiconductor currently expects that it may also be able to utilize the remediated water from the OU1 treatment system for some time after it completes the shutdown process. Changing economic circumstances or operational transition issues may alter this timeline. Freescale will notify ADEQ if ON Semiconductor reports any future changes to its anticipated shutdown schedule.

Freescale worked with Conestoga-Rovers & Associates (CRA) to install a connection to the COP sanitary sewer from the treated water discharge line at the Integrated Groundwater Treatment Plant (IGWTP). The pipeline and above-ground construction was completed at the end of November 2010. Freescale is in the process of completing the remaining steps necessary to receive final industrial discharge permit approval from the City of Phoenix to initiate the discharge of treated water to the COP sanitary sewer. This ADEQ-approved discharge option for the treated water will be available when ON Semiconductor shuts down its manufacturing operations and can no longer take water from the IGWTP.

ON Semiconductor and Freescale conducted a joint study to evaluate using a portion of the treated water after closure of ON Semiconductor's manufacturing operations. Preliminary results indicated that only a small portion of the treated water might be used by ON Semiconductor as cooling tower makeup water. The monthly percentage would be less than 10%, and could be as low as 5%, during approximately six months of the year depending on the makeup water demand for the cooling towers in a given month. Freescale and ON Semiconductor are still evaluating the infrastructure impacts and water conditioning requirements of using the treated water in the ON Semiconductor cooling towers and have not made a final decision at the time of this report. However, since the amount of treated water that could eventually go to ON Semiconductor for cooling towers is relatively insignificant compared to the total volume of treated water, this possible use does not impact selection of the long-term end use alternative.

ADEQ approved the discharge of treated water to the COP sanitary sewer as an interim solution while a more permanent long-term solution was implemented. It should be noted that in Freescale's June 10, 2009 letter evaluating End Use Alternatives, Freescale identified the need to continue periodic discharges to the sanitary sewer to minimize potential down

time of the OU1 groundwater remediation system during necessary maintenance activities associated with several of the long-term discharge alternatives (including discharge to the Grand Canal and injection). Clear Creek understands that ADEQ's approval of the COP sanitary discharge alternative was intended to cover these continued periodic short-term discharges.

3.0 INJECTION OF TREATED GROUNDWATER

Clear Creek Associates (Clear Creek), on behalf of Freescale, evaluated the technical and economic practicability of injecting the treated water from the IGWTP back into the alluvial aquifer. Clear Creek first reviewed various locations for injection. The injection well (or wells) had to be a sufficient distance away from the extraction wells so as to not adversely impact the existing capture zone. The injection wells also needed to be in a location with an adequate thickness of unsaturated alluvium so that the groundwater mounding caused by the injection would not rise too close to the land surface. In general, the depth to groundwater is shallow in the vicinity of the facility and deepens to the west. Given the density of residential and urban development in the area, and the requirement of an adequate unsaturated thickness, the potential options for siting the injection wells are very limited. Only one location, at approximately 42nd Street and Portland on the north side of State Route Loop 202 (SR 202), appeared feasible. The depth to groundwater in this area was approximately 70 feet in September 2010.

3.1 Modeling of Injection Option

Clear Creek simulated injection of the treated water using the groundwater model previously documented in Appendix A of "Groundwater Remedial Analysis Alternatives" (GeoTrans, 2005). This groundwater flow model was developed to simulate the OU1 system at the 52nd Street facility and to evaluate the future of the ongoing remedy including impacts caused by continued drought and changes to the distribution of pumping. The model was constructed based on field data collected over many years and using the knowledge from several previous models of the site. The OU1 Model was developed using the following approach:

1. The model objectives, as described in Section 1.1 of Appendix A of the GeoTrans report, were defined and the specific areas of interest were identified. From these, the model domain and orientation were developed and the appropriate model codes were selected.
2. The conceptual site model was refined in the area of interest.
3. The finite-difference grid was constructed.
4. Site alluvial and bedrock flow and transport properties were compiled.
5. Appropriate recharge and infiltration rates and water level data were assembled for input to the model.

6. Boundary conditions and inactive (no-flow) areas were defined.
7. The steady state flow model was calibrated to observed groundwater level elevations for the year 1992, when monitor well data were widely available and the off-site portion of OU1 was not yet operating.
8. The flow model was run transiently from year 1991 to the end of year 2004 and calibrated to historical water levels at various locations throughout the model domain.
9. The sensitivity of input parameters was tested by varying measured or assumed hydrogeologic or model parameters within reasonable ranges.

The OU1 Model domain is 35,000 feet east-west by 40,000 feet north-south for a total area of 50 square miles, and has a maximum thickness of up to about 1,400 feet. The model domain is shown on Figure 2. The original model grid was supplemented with an additional eight rows and eight columns to refine the grid at and around the injection locations. The original model grid was refined in the area of the simulated injection wells to allow for more detailed predictions of water levels. The revised model grid now has 259 rows, 194 columns, and 3 layers giving a total of 150,738 calculation cells. Cells vary in size from 10 feet by 10 feet at the injection wells to 500 feet by 500 feet at the edges of the model domain. In addition to the detailed simulations of water levels in the vicinity of the proposed injection wells, the model layers were also designed specifically to allow detailed simulation of the groundwater flow around the bedrock ridge just west of the 52nd Street facility. The model grid dimensions were sufficiently small in the area of the 52nd Street facility to allow simulation of individual extraction wells.

A review of the predicted results and measured water levels for several discrete time periods and at several wells over time showed that the model was well calibrated and was suitable for predicting the impacts for various scenarios into the future. The quantitative measures of the transient model calibration for 1992, 1997 and 2002 are:

Statistical Criteria	1992 Model Value	1997 Model Value	2002 Model Value	Acceptable Value ^(a)
Mean Error (ME)	-1.072 ft	2.178 ft	-2.948 ft	< 10 ft
Mean Absolute Error (MAE)	4.927 ft	5.236ft	3.723 ft	< 10 ft
Percent Root Mean Square Error (%RMSE)	4.08 %	3.296 %	2.547 %	< 10 %
Correlation coefficient (R)	0.984	0.995	0.994	> 0.7

^(a) Values based on consideration of natural heterogeneity, boundary conditions, complexity of hydrogeologic system, and amount of data available to calibrate the model (Spitz and Moreno, 1996).

The objective of the modeling effort was to evaluate the potential groundwater mounding – a localized area of elevated water levels – caused by injecting the treated groundwater back to the aquifer. As water is injected into a well, it flows radially out from the well into the aquifer formation. However, since the aquifer formation across from the well screen is composed of varying percentages of sand, gravel, silt and clay, the water cannot flow out into the aquifer as fast as it is injected into the well. This causes the water levels in, and in the vicinity of, the injection well to rise with respect to the background water level. This localized area with the observed water level rise is referred to as a groundwater mound. The less conductive or permeable the sediments are in the vicinity of the injection well, the slower the injected water can move away from the well and, therefore, the greater the groundwater mounding.

Predicted water levels in the injection well cells were used to calculate the predicted head in the well assuming an efficiency of 40 percent. Well efficiency is a measure of the theoretical drawdown (or rise) in a well compared to the actual drawdown (or rise) and can be estimated by relating the change in water level in a well casing due to pumping or injection of water compared to the change observed in the aquifer a short distance from the well. Well efficiency is influenced by a number of factors including the type of slotted pipe use, the size of the open areas, the type and size of the filter material, and the degree that the filter pack has been developed. If the screen opening, the gravel pack, or the formation becomes clogged with chemical, biological or physical components, the efficiency will decline. The assumption of 40 percent was chosen as a conservative estimate and in anticipation of efficiency degradation over time that is typically observed in injection wells.

The primary acceptance criterion established for injection alternatives was to maintain the maximum observed groundwater mound to depths greater than 30 feet beneath ground surface (bgs) to avoid potentially detrimental effects to overlying structures. In addition to keeping the depth to water at the well head greater than 30 feet bgs, an additional criterion was to maintain the water level rise to less than 10 feet in the vicinity of the SR 202 Freeway, located approximately 340 feet south of the southern simulated injection well.

The injection of groundwater was initially simulated with one well; however, this resulted in estimated mounding that brought groundwater to within approximately 15 feet of land surface, failing the primary acceptance criterion. A second case using two injection wells placed approximately 170 feet apart was simulated and resulted in mounded groundwater reaching a maximum depth of approximately 33 feet bgs. A map showing the locations of the simulated injection wells and predicted groundwater elevations after 10 years of operations is presented as Figure 3. The predicted mounding, or rise in water levels, is presented as Figure 4. Figure 4 shows that the model predicts an increase in water level of 10 feet in an area of approximately 140 feet in diameter centered on the two wells. Thus, the two injection well scenario met both of the acceptance criteria described above. The table below shows the predicted and efficiency adjusted predicted water levels.

Wells	Approximate Surface Elevation	Predicted Head in Well (ft)	Predicted Mounding in Well (ft)	Efficiency Corrected Mounding (ft)	Corrected Water Level (Elevation)	Corrected Depth to Water (ft)
1-Well	1161	1112.3	-22.3	-55.8	1145.8	15.2
2-Wells	1161	1105.2	-15.2	-37.9	1127.9	33.1

Assumes well efficiency of 40%.

The groundwater mounding predictions are based on the assumptions used in the model. While the model was shown to be well calibrated, aquifer material properties can be highly variable even over short distances. In the area of the simulated injection wells, the model used a hydraulic conductivity of 40 feet per day. If the hydraulic conductivity in this area is significantly lower, then the water to be injected may need to be distributed to additional injection wells which would significantly increase costs.

3.2 Well Design and Installation

As discussed above, the modeling indicated that a minimum of two injection wells would be necessary to prevent excessive mounding of the water table in the area. Monitoring of the water level mound would also be necessary. The injection wells are located in the vicinity of existing monitoring well DM120. However, one additional monitor well would need to be installed to monitor the water level mound to the south in the vicinity of SR 202. Finally, as discussed below, regular redevelopment of the injection wells is necessary to minimize the loss of injection efficiency over time. It is recommended that the injection wells be routinely redeveloped at a rate of 150% of their design capacity. Since the COP sanitary sewers in the vicinity of the injection wells do not have the capacity to accept this volume of development water, an alternate means of water disposal is necessary. Therefore, an additional two redevelopment injection wells have been sited to accept the development water from the primary injection wells for ongoing maintenance purposes. The estimated locations for the primary injection wells, monitoring well, and redevelopment injection wells are shown on Figure 5.

The two injection wells would be 12-inch diameter wells and installed to about 140 feet bgs. A sample well design for the injection wells is shown on Figure 6. In addition to existing monitoring wells in the area, an additional monitoring well would be installed to observe the effects of the injection. As shown on Figure 5, the monitoring well would be installed south of the southernmost injection well at approximately 42nd Street north of the SR 202 freeway. The five-inch diameter monitoring well would be drilled to a depth of about 120 feet bgs. A sample monitoring well design is shown on Figure 7.

Suspended solids in the injected water are removed as the water flows from the well, through the gravel pack, and into the surrounding formation. This filtration of the suspended solids continues to build up, accumulating a filter cake, which impedes flow from the well. The well can also be clogged by biological growth. It is difficult to estimate the amount of plugging that will occur during operation of an injection well and by what mechanism. The frequency of redevelopment depends on the rate of plugging. Part of the required maintenance for the injection wells involves periodically pumping the wells to clean and redevelop them. As noted above, the pumping rate is recommended to be significantly greater than the injection rates in order to adequately redevelop the wells.

The development water would need to be managed in one of two ways: either pumped to waste, or pumped to a shallow injection well. CRA evaluated the available capacity of nearby sewer lines and determined that the capacity to accept the pumped water was not sufficient. Thus, this option would also require installation of two redevelopment injection wells in the area at the approximate locations show on Figure 5. The redevelopment injection wells were designed with a large diameter (48-inch) borehole to create a larger high conductivity zone to accommodate the higher flow rates created during the injection well development activities. The 48-inch diameter redevelopment injection wells would be drilled to a depth of approximately 70 feet bgs. A sample design of a redevelopment injection well is shown on Figure 8.

3.3 Pipeline Installation

The injection alternative also requires that a pipeline be installed to convey the treated water from the 52nd Street facility to the proposed injection wells. CRA reviewed information from the City of Phoenix regarding the number and locations of existing utilities in McDowell Road and concluded that it is not practicable to install a new treated water pipeline within McDowell Road from the 52nd Street facility west to the proposed injection locations. As discussed below, CRA evaluated two alternative pipeline alignments to the proposed injection wells (Figure 9) (provided by CRA).

As shown as Route 1 on Figure 9, the shorter alternative extends west from the 52nd Street facility in COP right-of-way along Culver Street and across the Brunson-Lee Elementary School property to the OCC. The pipeline would have to go under both the OCC and the SR 143, then continue south in ADOT right-of-way along the SR 143 and west along the SR 202 freeway, a total distance of approximately 7,970 feet.

The second pipeline alignment (Route 2 on Figure 9) would extend south from the 52nd Street facility along 50th Street and then west in ADOT right-of-way along the north side of SR 202. At SR 143, it would head north a short distance and then west under the SR 143 and follow the same alignment as the other alternative to the injection well sites, a total distance of approximately 10, 960 feet.

3.4 Regulatory and Permitting Requirements

After the proposed end use is selected and the preferred pipeline alignment is agreed upon by all the key stakeholders and land owners, an Explanation of Significant Differences (ESD) to the 1988 Letter of Determination (LOD) and Record of Decision (ROD) will need to be issued by ADEQ and EPA to designate the new end use of the treated water. It is anticipated that ADEQ and EPA would issue a draft ESD for public review and comment. After completion of the public review period, ADEQ and EPA would issue a final ESD designating the new end use. It is estimated that the ESD process will take a minimum of six months to complete.

After the final ESD is issued, the 1989 Consent Order for the OU1 groundwater remedy will need to be modified to conform to the new designated end use. The Consent Order recognizes that there may be need to modify the remedy and creates a mechanism for the parties to modify the Consent Order by mutual agreement. Therefore, ADEQ and Freescale (who is implementing the terms of the Consent Order as Motorola's successor) can agree to modify the end use of the treated water provided that the new end use meets the requirements of Title 45 and applicable rules and regulations. It is estimated that a modification to the Consent Order to conform to the new designated end use would take a minimum of three to six months to complete.

The two primary injection wells and two redevelopment injection wells may be considered Class V injection wells under the EPA's Underground Injection Control (UIC) Program. The wells are likely authorized by general rule and would be exempt from permitting under the ADEQ Aquifer Protection Permit (APP) program because they are part of a federal Superfund remediation response action under the Comprehensive Environmental Remediation, Compensation and Liability Act (CERCLA). Under CERCLA, EPA-directed response actions are exempt from administrative permitting requirements. Nevertheless, use of the wells would have to comply with the substantive requirements of the APP program. Pre-application meetings with ADEQ and EPA, and the Arizona Department of Water Resources (ADWR) would be held to review the proposed well installation, purpose, and design to determine the various agencies' substantive permit requirements. It is anticipated that supplemental water quality and groundwater modeling analyses may be required to meet the substantive permitting requirements of the agencies. Demonstrating that the substantive permitting

requirements have been met and receiving the agencies' concurrence is estimated to take approximately six to 12 months.

Although technically not necessary due to the CERCLA permit exemption, groundwater for the OU1 remedy is currently being extracted through a Poor Quality Groundwater Withdrawal Permit (PQGWWP) issued by ADWR. The existing PQGWWP specifies that the treated groundwater will be used in the manufacturing processes at the 52nd Street facility. The PQGWWP would need to be terminated or modified to change the designated end use of the water to reinjection. It is estimated that the PQGWWP modification would take an estimated six months to complete after the Consent Order is modified.

Freescall proposes to install all of the wells in COP right-of-way as shown on Figure 5. This would require a right-of-way permit from the City. All permit applications would require a land ownership survey and utilities survey of the areas. Maps would be prepared for the wells and plumbing of the wells to the pipeline. The City anticipates that Development Services Department, Water Services Department, and Street Transportation Department would be involved in the permitting. This phase of the permitting is dependent on confirmed approval from ADWR, ADEQ, and EPA for the installation of the wells. Permitting with the City to install the wells in City right-of-way is anticipated to take about a minimum of three to six months after obtaining approval from ADWR, ADEQ, and EPA for the installation of the wells and completing the final well design and selection of the well installation subcontractor.

For the pipeline installation, permitting for the shorter alternative would involve the City of Phoenix, ADOT, the United States (US) Bureau of Reclamation and its agent Salt River Project (SRP), Flood Control District of Maricopa County (FCDMC), the Brunson-Lee Elementary School, and the Balsz School District. Permitting for the longer alignment would involve the City of Phoenix, US Bureau of Reclamation and its agent SRP, FCDMC, and ADOT. Crossing the OCC area, in addition to other permitting and access agreements, will require cultural resource and biological resource clearances through the US Bureau of Reclamation. This permitting of the pipeline is anticipated to take a minimum of 24 to 36 months to complete. The permitting process would be initiated prior to completion of the design, but permit finalization is subject to finalization of the pipeline design. In City right-of-way, Freescall currently has a Revocable Permit with the City for the existing extracted groundwater pipeline leading to the IGWTP. Clear Creek has confirmed with the City that the revocable

permit is the appropriate mechanism to use for permitting a treated water pipeline in City right-of-way. Freescale would need to obtain either a new revocable permit or modify its existing permit for the new pipeline. It is estimated that it will take three to six months after completion of the pipeline design to obtain a new or modified revocable permit from the City.

With regard to ADOT right-of-way, Freescale met with ADOT on October 18, 2010 to discuss potential access to ADOT right-of-way for the OCC discharge. ADOT has since indicated that for operational and safety reasons, its policy is against allowing longitudinal access along freeway right-of-way and that it would prefer that Freescale consider other alignments. It is also anticipated that ADOT will also require cultural resource, biological resource, and other environmental clearances. Given the ADOT policy and the significant extent of ADOT right-of-way considered for the longer pipeline alignment, significantly longer access and permitting timeframes (on the order of 18 months to two years) would be required for approval of this alternative, if the alternative is feasible at all.

Freescale met with representatives from the Balsz School District on October 28 and November 22, 2010. At the meetings, school district personnel indicated a willingness to allow installation of the pipeline on Brunson-Lee Elementary School property. Freescale is continuing to discuss access and easement logistics with personnel from the school district and the Brunson-Lee Elementary School. Securing access to the pipeline easement is anticipated to take a minimum of 12 months to complete.

3.5 Implementation

Pipeline design will be initiated following selection of the new end use (through the ESD) and modification of the 1989 Consent Order. Detailed utility drawings will need to be developed or obtained for each segment of the proposed pipeline alignments and, in certain instances, utility locations will need to be verified in order to develop a final pipeline location. Once the final pipeline location is determined, the pipeline design will be finalized. The overall pipeline evaluation and design process is estimated to take nine months to complete.

Following completion of the pipeline design, construction contractors will need to be procured. The contractor procurement process is estimated to take two to three months to complete. After the contractor is selected, it will take approximately one month for

materials to be obtained and for the contractor to mobilize to the site. It is anticipated that two parallel construction pathways will be conducted concurrently. One construction pathway involves the installation of the piezometer and the injection and redevelopment injection wells as discussed in Section 3.2 and shown on Figure 5. The second construction pathway involves the construction of the pipeline and the injection and redevelopment injection well head completions. The well installation pathway is the shorter of the two and would be completed prior to the completion of the pipeline. Construction of the well heads and the shorter of the two pipeline alignments is expected to take a minimum of six months to complete. Construction of the well heads and the longer of the two pipelines is estimated to take approximately eight to nine months to complete.

A preliminary schedule comparing the implementation timeframe for the Injection Alternatives to the OCC Discharge Alternatives is included as Attachment A. As noted in Section 3.4, above, achieving consensus on a feasible pipeline alignment is the critical path item for the overall implementation schedule. This is especially evident for the Injection Alternatives given the significant limitations of sites where injection is both technically feasible and accessible and the high degree of uncertainty associated with securing the necessary access to ADOT right of way.

A summary of the costs to install the injection, monitoring and redevelopment injection wells and the pipeline are shown on Table 1 for each pipeline alignment. More detailed cost estimates are included as Table 2 (Well Installation Cost Estimate), Table 3 (Route 1 Injection Pipeline) (provided by CRA), and Table 4 (Route 2 Injection Pipeline) (provided by CRA). If the shorter pipeline option across the Brunson-Lee school is used (Route 1 on Figure 9), the estimated cost for pipeline and wells would total approximately \$3,877,900. For the longer route using ADOT right-of-way (Route 2 on Figure 9), the estimated cost would total \$4,126,900. The estimated operation and maintenance costs for the injection option for one year total \$57,700 (see Table 2).

Although the modeling results show that it is physically possible to inject the treated water into the aquifer at the selected location, the cost and disruption related to maintenance of the injection wells and installation of the pipeline to transport the treated water to the injection wells makes this option both technically and economically impracticable, especially when compared to the OCC/Grand Canal alternative discussed below. Moreover, injection wells are vulnerable to chemical, biological and physical fouling and subject to reduced

efficiencies over time. At a minimum, it is recommended that the injection wells be redeveloped on an annual basis. Depending on the nature of the injected water and observed well efficiencies, this process may be required more frequently, increasing downtime of the system, maintenance requirements and costs. Further, as the well efficiencies decline over time, more frequent well redevelopment would be necessary, increasing costs and operational disruptions.

4.0 DISCHARGE TO THE GRAND CANAL VIA THE OLD CROSSCUT CANAL (OCC)

This long-term alternative consists of discharging the remediated water to the Grand Canal via a direct discharge to the OCC for beneficial use for irrigation and/or underground storage and recovery. Freescale looked at two different pipeline alignments under this alternative: along ADOT right-of-way and across the Brunson-Lee Elementary School.

Freescale, Clear Creek and CRA met with SRP on August 31, 2010 to discuss this alternative end use. SRP confirmed its willingness to accept the water into the OCC. Currently, water in the OCC is diverted via a lateral to the Grand Canal from an existing gate structure south of Van Buren Street. SRP confirmed that it will have sufficient demand on the Grand Canal system to utilize the remediated water for an extended time. A license agreement would be required from both SRP and the FCDMC to construct the connection at the OCC. The FCDMC has some operation and maintenance obligations for the OCC through an Intergovernmental Agreement (IGA).

Discharge to the Grand Canal would need to meet the substantive provisions of the Arizona Pollution Discharge Elimination System (AZPDES) program. The applicable surface water quality standards for the Grand Canal are agricultural irrigation (AgI) standards. Inorganic water quality monitoring of the treated water has demonstrated that, except for naturally occurring boron, the treated water meets the AgI standards. However, the treated water has naturally occurring boron concentrations of 1.8 milligrams per liter (mg/L), slightly above the 1.0 mg/L AgI standard for boron. Therefore, it would be necessary to establish a mixing zone and compliance monitoring point in the Grand Canal downstream of the discharge point to demonstrate that the discharge does not cause an exceedance of the boron standard in the Grand Canal. SRP has indicated that, except for the annual dry-up, there is always sufficient flow in the Grand Canal such that the OU1 discharge would not cause an exceedance of the AgI standard in the Grand Canal. The OU1 system would not discharge to the Grand Canal during the annual dry-up period. During this time, IGWTP water would be discharged to the COP sanitary sewer at the 52nd Street facility.

4.1 Pipeline along 50th & Culver Streets/Brunson-Lee Elementary School to OCC

The first pipeline alignment evaluated would run from the IGWTP south along 50th Street and then west along Culver Street, then cross the Brunson-Lee Elementary School to the OCC discharge point, a total of approximately 2,980 feet (Route 1 on Figure 10) (provided by CRA). This alignment would require access to the City of Phoenix right-of-way on 50th Street and Culver Street, to the Brunson-Lee Elementary School property, and then across US Bureau of Reclamation property to the OCC. All permit applications would require a land ownership survey and utilities survey of the areas. Maps of the pipeline alignment would need to be prepared for the City permit application. The City anticipates that Development Services Department, Water Services Department, and Street Transportation Department would be involved in the permitting. Freescale met with representatives from the Balsz School District on October 28 and November 22, 2010. At the meeting, school district personnel indicated a willingness to allow installation of the pipeline on school property. Freescale has continued to discuss access and easement logistics with personnel from the school district and the Brunson Lee Elementary School.

4.2 Pipeline along 50th Street/ State Route Loop 202 Alignment to OCC

The second potential pipeline alignment evaluated would run south from the IGWTP along 50th Street and then west along the SR 202 alignment to the OCC, a total of approximately 4,640 feet (Route 2 on Figure 10) (provided by CRA). This alignment would require access to City of Phoenix right-of-way, to ADOT right-of-way, and then across US Bureau of Reclamation property to the OCC. All permit applications would require a land ownership survey and utilities survey of the areas. Maps of the pipeline alignment would need to be prepared for the City permit application. The City anticipates that Development Services Department, Water Services Department, and Street Transportation Department would be involved in the permitting.

With regard to ADOT right-of-way, Freescale met with ADOT on October 18, 2010 to discuss potential access to ADOT right-of-way for the OCC discharge. ADOT has since indicated that for operational and safety reasons, its policy is against allowing longitudinal access along freeway right of way and that it would prefer for Freescale to consider other alignments. In this instance, the ADOT right of way is on the north side of an existing storm water channel approximately 120 feet north of SR 202. Follow-up discussions with ADOT are warranted to

determine if it is feasible for the pipeline to be located in ADOT right-of-way along this storm water channel, or if the pipeline alignment would need to be shifted north to Roosevelt Street. There are, however, a greater number of utilities located in Roosevelt Street including the existing extracted groundwater transmission pipeline from the OCC to the IGWTP. Installation of an additional transmission pipeline within Roosevelt Street would be more difficult than use of the ADOT right of way.

4.3 Regulatory and Permitting Requirements

As discussed in Section 3.4, it is anticipated that ADEQ and EPA will issue an ESD to designate the new end use of the treated water. It is anticipated that ADEQ and EPA would issue a draft ESD for public review and comment. After completion of the public review period, ADEQ and EPA would issue a final ESD designating the new end use. It is estimated that the ESD process will take a minimum of six months to complete.

After the final ESD is issued, the 1989 Consent Order for the OU1 groundwater remedy will need to be modified to conform to the new designated end use. As discussed in Section 3.4, the Consent Order can be agreed upon by the parties. It is estimated that a modification to the Consent Order to conform to the new designated end use would take a minimum of three to six months to complete.

As discussed in Section 3.4, groundwater for the OU1 remedy is currently being extracted through a PQGWWP issued by ADWR. The existing PQGWWP specifies that the treated groundwater will be used in the manufacturing processes at the 52nd Street facility. The PQGWWP would need to be terminated or modified to change the designated end use of the water to discharge to the Grand Canal for irrigation use. It is estimated that the PQGWWP modification would take an estimated six months to complete after the Consent Order is modified.

As discussed earlier in Section 4.0, discharge to the Grand Canal would need to meet the approval of SRP and substantive provisions of ADEQ's AZPDES program. The applicable surface water quality standards for the Grand Canal are agricultural irrigation (AgI) standards. Inorganic water quality monitoring of the treated water has demonstrated that, except for naturally occurring boron, the treated water meets all AgI standards. The AZPDES program allows for establishing a downstream compliance monitoring point in order to demonstrate

that in-stream water quality standards are met at the end of an established mixing zone. This mixing zone cannot extend farther than 500 meters downstream of the discharge point and cannot overlap another mixing zone. Although it is not necessary to obtain an AZPDES permit as a result of the CERCLA permit exemption, it is necessary to comply with the substantive provisions of the AZPDES program. Compliance with the substantive provisions of the AZPDES program can be demonstrated through point of discharge and downstream compliance monitoring. ADEQ has approved this approach at other Superfund remediation projects including for the OU 2 remedy at the 52nd Street Site. SRP has indicated it is willing to accept the treated water discharge provided that ADEQ approves the mixing zone approach meeting the substantive requirements of the AZPDES program. Assuming ADEQ approves the direct discharge to the OCC, demonstrating compliance with and receiving ADEQ's approval that the substantive provisions of the AZPDES program have been met is anticipated to require a minimum of 12 to 15 months after the final ESD is issued.

For the pipeline installation, permitting for the 50th & Culver streets/Brunson-Lee Elementary School to OCC alternative would involve the City of Phoenix, the Brunson-Lee Elementary School, the Balsz School District, and the US Bureau of Reclamation and its agent SRP, and FCDMC. Crossing the OCC area, in addition to other permitting and access agreements, will require cultural resource and biological resource clearances through the US Bureau of Reclamation. This permitting of the pipeline is anticipated to take a minimum of 18 to 24 months to complete. The permitting process would be initiated prior to completion of the design but permit finalization is subject to finalization of the pipeline design. In City right-of-way, Freescale currently has a Revocable Permit with the City for the existing extracted groundwater pipeline leading to the IGWTP. Clear Creek has confirmed with the City that the revocable permit is the appropriate mechanism to use for permitting a treated water pipeline in City right-of-way. Freescale would need to obtain either a new revocable permit or modify its existing permit for the new pipeline. It is estimated that it will take three to six months after completion of the pipeline design to obtain a new or modified revocable permit from the City.

Freescale met with representatives from the Balsz School District on October 28 and November 22, 2010. At the meetings, school district personnel indicated a willingness to allow installation of the pipeline on school property. Freescale is continuing to discuss access and easement logistics with personnel from the school district and the Brunson-Lee

Elementary School. Securing access to the pipeline easement is anticipated to take a minimum of 12 months to complete.

For pipeline installation, permitting for the 50th Street/ SR 202 alignment to OCC alternative would involve the City of Phoenix, US Bureau of Reclamation and its agent SRP, FCDMC, and ADOT. Crossing the OCC area, in addition to other permitting and access agreements, will require cultural resource and biological resource clearances through the US Bureau of Reclamation. In City right-of-way, Freescale currently has a Revocable Permit with the City for the existing extracted groundwater pipeline leading to the IGWTP. Clear Creek has confirmed with the City that the revocable permit is the appropriate mechanism to use for permitting a treated water pipeline in City right-of-way. Freescale would need to obtain either a new revocable permit or modify its existing permit for the new pipeline. It is estimated that it will take three to six months after completion of the pipeline design to obtain a new or modified revocable permit from the City.

With regard to ADOT right-of-way, Freescale met with ADOT on October 18, 2010 to discuss potential access to ADOT right-of-way for the OCC discharge. ADOT has since indicated that for operational and safety reasons, its policy is against allowing longitudinal access along freeway right of way and that it would prefer that Freescale to consider other alignments. Should ADOT consider this alternative, ADOT may also require cultural resource, biological resource, and other environmental clearances. Freescale is continuing to discuss access and easement logistics with personnel from ADOT and SRP. Permitting of this alternative is anticipated to take a minimum of 12 to 24 months.

4.4 Implementation

Pipeline design will be initiated following selection of the new end use (through the ESD) and modification of the 1989 Consent Order. Through the implementation of other investigations in the area, utilities locations for a portion of the area with the proposed pipeline alignments are already available. Additional utility drawings will need to be obtained for the remaining pipeline segments to finalize the pipeline location. Once the final pipeline location is determined, the pipeline design will be finalized. The overall pipeline evaluation and design process is estimated to take three to four months to complete.

Following completion of the pipeline design, construction contractors will need to be procured. The contractor procurement process is estimated to take two to three months to complete. After the contractor is selected, it will take approximately one month for materials to be obtained and for the contractor to mobilize to the site. Following mobilization, the pipeline to the OCC will be constructed. Construction of the shorter of the two pipeline alignments is expected to take one and one-half to two months to complete. Construction of the longer of the two pipeline alignments is estimated to take two to three months to complete.

The estimated cost to construct this pipeline using the Brunson-Lee alignment is \$881,000 as shown in Table 5 (provided by CRA). This amount is significantly less than the cost to inject the treated water as discussed in Section 3, above. Because of the shorter pipeline distance, it also causes significantly less disruption to the neighborhood. Furthermore, it does not require use of the ADOT alignment which should simplify and significantly expedite the permitting process.

A preliminary schedule comparing the implementation timeframe for the OCC Discharge Alternatives to the Injection Alternatives is included as Attachment A. As can be seen on Attachment A, the OCC Discharge Alternatives can be implemented significantly sooner than the Injection Alternatives.

The estimated cost to construct the pipeline using the ADOT alignment is \$949,000 as shown in Table 6 (provided by CRA). As with the Brunson-Lee alignment discussed in Section 4.1, above, the cost to construct this discharge option is significantly less than the cost to inject the treated water discussed in Section 3, above. Because of the shorter pipeline distance, it too causes significantly less disruption to the neighborhood. However, due to the need to run longitudinally along the SR 202, it is less preferable from a permitting perspective than the Brunson-Lee alternative discussed in Section 4.1, above.

5.0 PREFERRED ALTERNATIVE

Based on this analysis, Freescale proposes discharging to the Grand Canal via the OCC as its preferred alternative for long-term use of the treated groundwater generated by the OU1 groundwater remedy. The pipeline for the preferred alternative would follow the 50th & Culver Streets/Brunson-Lee Elementary School to OCC alignment as shown on Figure 11.

As detailed above in the report, this alternative is preferred for the following reasons:

- Irrigation use is a beneficial end use as required by ADWR and the LOD / ROD.
- The demand for and use of water discharged to the Grand Canal via the OCC exists and will continue for the foreseeable future.
- The feasibility of securing the necessary access is the highest with the Brunson-Lee alignment to the OCC. The school district has already indicated a willingness to allow installation of the pipeline on its property and this alignment would not require crossing under the SR 143 or going alongside the SR 202 freeway.
- The amount of disruption to the neighborhoods, streets, and highways is minimized with the Brunson-Lee alignment to the OCC as compared to the ADOT alignment to the OCC, or either of the injection alignments.
- The timeframe necessary to permit and implement the OCC discharge using the Brunson-Lee alignment should also be significantly shorter, involve the least number of access approvals and, therefore, be less complicated than the either of the injection alternatives, or the ADOT to OCC alternative.
- The pipeline length would be the shortest of all the alternatives, significantly reducing the construction timeframe.
- The quantity of treated water discharged to the COP sanitary sewer will be minimized by shorter construction and permitting timeframes.
- The preferred alternative is significantly less costly to implement than the other options, especially when compared to injection. Discharge to the Grand Canal via the OCC using the Brunson-Lee alignment would cost approximately \$881,000 compared to \$949,000 for the ADOT/OCC discharge. The injection alternatives would be at least four times higher at about \$3,877,900 and \$4,126,900 for the Brunson-Lee or ADOT alignments, respectively.

- The OCC discharge is a more reliable end use alternative than injection over the long term due to its operational simplicity. Long-term reductions in well efficiencies and increased operation and maintenance requirements will increase costs and potentially reduce the overall operational reliability of the injection alternative.

Based on the above factors, Freescale proposes the option of discharging treated water to the OCC using the Brunson-Lee pipeline alignment as its preferred long-term alternative for discharge and beneficial end use of treated water from the IGWTP. The previously approved COP sewer discharge would be used as a backup for discharge during maintenance and canal dry-up periods.

6.0 REFERENCES

- Arizona Department of Environmental Quality (ADEQ), 2009. Letter to Jenn McCall, Freescale Semiconductor RE: Motorola 52nd Street Superfund Site – Operable Unit 1, ADEQ/EPA Comments to the Freescale Submittal *Evaluation of Remediated Groundwater End Use Options*, June 10, 2009. Letter provided ADEQ and EPA approval of discharge into the City of Phoenix sanitary sewer as a temporary solution for use of treated effluent from the OU1 Treatment Plant. July 14, 2009.
- Arizona Department of Environmental Quality (ADEQ), 2010. Letter to Jenn McCall, Freescale Semiconductor RE: Motorola 52nd Street Superfund Site – Operable Unit 1, Evaluation of Remediated Groundwater End Use Options response to comments letter of December 11, 2009, submitted by Clear Creek Associates. Letter provided ADEQ and EPA support of discharge into the City of Phoenix sanitary sewer as a temporary solution for use of treated effluent from the OU1 Treatment Plant. January 26, 2010.
- Clear Creek Associates, 2010. Evaluation of Remediated Groundwater End Use Options – Revised, Operable Unit No. 1, 52nd Street Superfund Site, Phoenix, Arizona. Report prepared for Freescale Semiconductor, Inc. April 30, 2010.
- Freescale Semiconductor, 2009. Letter to Sherri Zendri, Project Manager, Arizona Department of Environmental Quality RE: Evaluation of Remediated Groundwater End Use Options, 52nd Street Superfund Site – Operable Unit 1. June 10, 2009.
- Freescale Semiconductor, 2010. Letter to Wendy Flood, Project Manager, Arizona Department of Environmental Quality RE: Update on Evaluation of Remediated Groundwater End Use Options, 52nd Street Superfund Site – Operable Unit 1. September 7, 2010.
- GeoTrans, Inc, 2005. Groundwater Remedial Analysis Alternatives, Motorola 52nd Street OU1, Phoenix, Arizona. Includes Appendix A - OU1 Evaluation Model Report by Clear Creek Associates. Report prepared for Freescale Semiconductor, Inc. September 30, 2005.

TABLES

TABLE 1
Injection Alternatives
Summary Cost Estimates

Alternative	Well Installation Cost (\$)	Pipeline Installation Cost (\$)	Total Cost (\$)
Pipeline Route 1	828,900	3,049,000	3,877,900
Pipeline Route 2	828,900	3,298,000	4,126,900

TABLE 2
Injection Alternatives
Well Installation Cost Estimate

Task	Hours	Labor (\$)	Expenses (\$)	Subcontract Costs (\$)	Total Cost (\$)
Planning/Permitting	276	37,000	500	0	37,500
Well Installation and development	516	57,700	5,000	472,000	534,700
Testing	82	10,000	400	54,500	64,900
Reporting	220	25,600	500	0	26,100
First Year O&M	392	45,200	500	12,000	57,700
Contingency	0	-	0	0	108,000
Total	1486	175,500	6,900	538,500	828,900

Assumptions:

Assumes drilling of two injection wells, two redevelopment water injection wells and one piezometer.

Pipeline and surface completion costs are not included

Costs for permanent pumps not included

Testing approach is not yet defined and may require additional costs

TABLE 3

**INJECTION ALTERNATIVES
ROUTE 1 - BRUNSON-LEE PIPELINE ALIGNMENT
CONSTRUCTION COST ESTIMATE**

I CONSTRUCTION COSTS:		<i>Total</i>
Division 1	GENERAL REQUIREMENTS	\$ 236,000
Division 2	SITE WORK	\$ 981,000
Division 3	CONCRETE	\$ 56,000
Division 11	EQUIPMENT	\$ 68,000
Division 13	SPECIAL CONSTRUCTION	\$ 136,000
Division 16	ELECTRICAL	\$ 223,000
		<hr/>
SUB-TOTAL ESTIMATED CONSTRUCTION COST		\$ 1,700,000
II ACCESS NEGOTIATIONS (5%)		\$ 85,000
III PREPARATION OF DESIGN (12%)		\$ 204,000
IV PERMITTING (6%)		\$ 102,000
V PROCUREMENT OF CONSTRUCTION CONTRACTOR		\$ 15,000
VI CONSTRUCTION MANAGEMENT (10%)		\$ 170,000
VII CONSTRUCTION QUALITY ASSURANCE (2%)		\$ 34,000
VIII FINAL CONSTRUCTION REPORT, AS-RECORDED DRAWINGS		\$ 35,000
		<hr/>
SUB-TOTAL ESTIMATED IMPLEMENTATION COSTS		\$ 2,345,000
IX CONTINGENCIES (30%)		\$ 704,000
		<hr/>
TOTAL ESTIMATED IMPLEMENTATION COSTS		\$ 3,049,000
		<hr/>

TABLE 4

**INJECTION ALTERNATIVES
ROUTE 2 - ADOT PIPELINE ALIGNMENT
CONSTRUCTION COST ESTIMATE**

I CONSTRUCTION COSTS:		<i>Total</i>
Division 1	GENERAL REQUIREMENTS	\$ 259,000
Division 2	SITE WORK	\$ 1,099,000
Division 3	CONCRETE	\$ 57,000
Division 11	EQUIPMENT	\$ 68,000
Division 13	SPECIAL CONSTRUCTION	\$ 136,000
Division 16	ELECTRICAL	\$ 223,000
		<hr/>
SUB-TOTAL ESTIMATED CONSTRUCTION COST		\$ 1,842,000
II ACCESS NEGOTIATIONS (5%)		\$ 92,000
III PREPARATION OF DESIGN (12%)		\$ 221,000
IV PERMITTING (6%)		\$ 111,000
V PROCUREMENT OF CONSTRUCTION CONTRACTOR		\$ 15,000
VI CONSTRUCTION MANAGEMENT (10%)		\$ 184,000
VII CONSTRUCTION QUALITY ASSURANCE (2%)		\$ 37,000
VIII FINAL CONSTRUCTION REPORT, AS-RECORDED DRAWINGS		\$ 35,000
		<hr/>
SUB-TOTAL ESTIMATED IMPLEMENTATION COSTS		\$ 2,537,000
IX CONTINGENCIES (30%)		\$ 761,000
		<hr/>
TOTAL ESTIMATED IMPLEMENTATION COSTS		\$ 3,298,000
		<hr/>

TABLE 5

**OCC TO GRAND CANAL DISCHARGE ALTERNATIVES
ROUTE 1 - BRUNSON-LEE PIPELINE ALIGNMENT
CONSTRUCTION COST ESTIMATE**

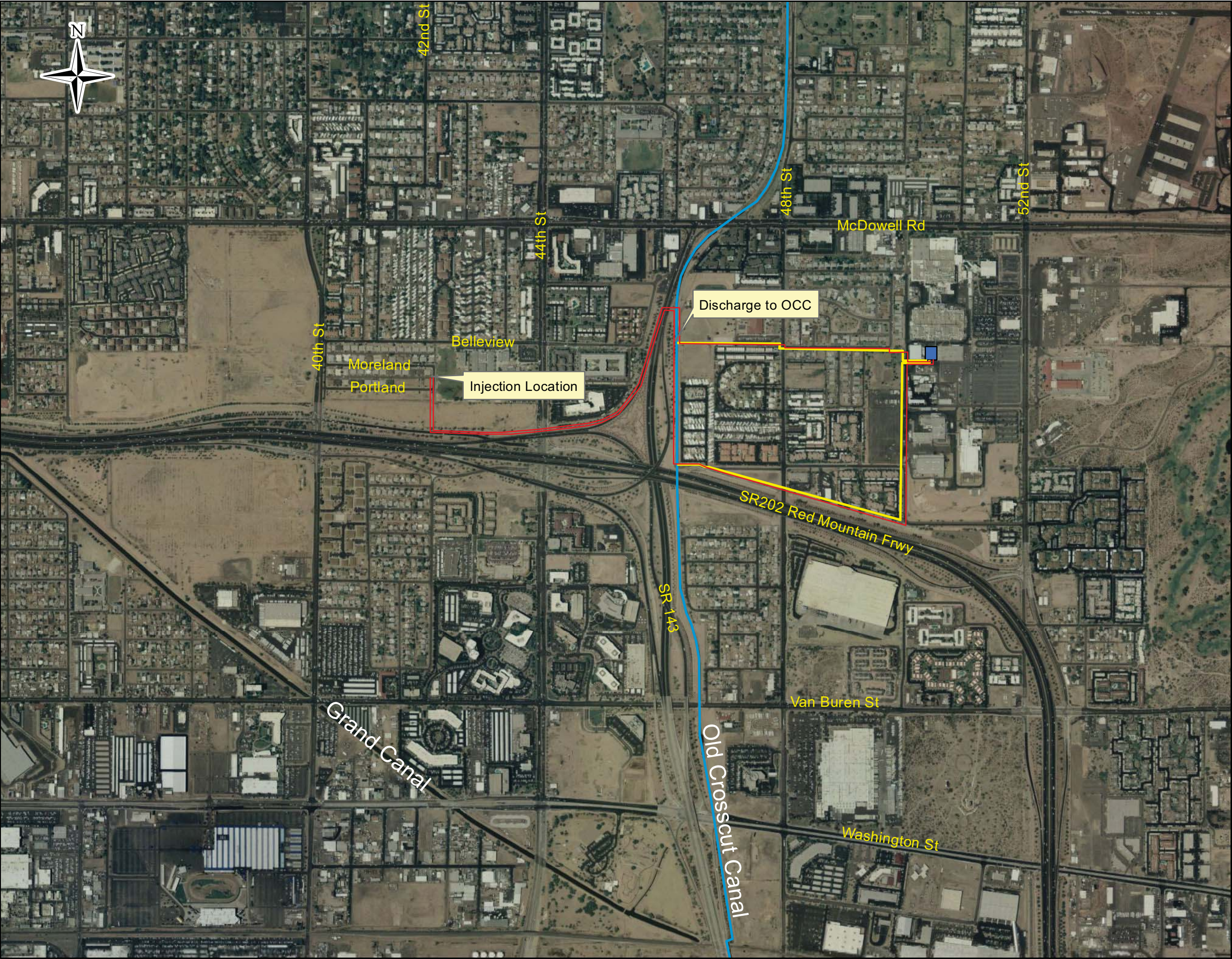
I CONSTRUCTION COSTS:		<i>Total</i>
Division 1	GENERAL REQUIREMENTS	\$ 68,000
Division 2	SITE WORK	\$ 374,000
Division 3	CONCRETE	\$ 5,000
Division 11	EQUIPMENT	\$ -
Division 13	SPECIAL CONSTRUCTION	\$ 21,000
Division 16	ELECTRICAL	\$ 5,000
		<hr/>
SUB-TOTAL ESTIMATED CONSTRUCTION COST		\$ 473,000
II ACCESS NEGOTIATIONS (5%)		\$ 24,000
III PREPARATION OF DESIGN (12%)		\$ 57,000
IV PERMITTING (6%)		\$ 28,000
V PROCUREMENT OF CONSTRUCTION CONTRACTOR		\$ 15,000
VI CONSTRUCTION MANAGEMENT (10%)		\$ 47,000
VII CONSTRUCTION QUALITY ASSURANCE (2%)		\$ 9,000
VIII FINAL CONSTRUCTION REPORT, AS-RECORDED DRAWINGS		\$ 25,000
		<hr/>
SUB-TOTAL ESTIMATED IMPLEMENTATION COSTS		\$ 678,000
IX CONTINGENCIES (30%)		\$ 203,000
		<hr/>
TOTAL ESTIMATED IMPLEMENTATION COSTS		\$ 881,000
		<hr/>

TABLE 6

**OCC TO GRAND CANAL DISCHARGE ALTERNATIVES
ROUTE 2 - ADOT PIPELINE ALIGNMENT
CONSTRUCTION COST ESTIMATE**

I CONSTRUCTION COSTS:		<i>Total</i>
Division 1	GENERAL REQUIREMENTS	\$ 75,000
Division 2	SITE WORK	\$ 400,000
Division 3	CONCRETE	\$ 6,000
Division 11	EQUIPMENT	\$ -
Division 13	SPECIAL CONSTRUCTION	\$ 21,000
Division 16	ELECTRICAL	\$ 9,000
		<hr/>
SUB-TOTAL ESTIMATED CONSTRUCTION COST		\$ 511,000
II ACCESS NEGOTIATIONS (5%)		\$ 26,000
III PREPARATION OF DESIGN (12%)		\$ 61,000
IV PERMITTING (6%)		\$ 31,000
V PROCUREMENT OF CONSTRUCTION CONTRACTOR		\$ 15,000
VI CONSTRUCTION MANAGEMENT (10%)		\$ 51,000
VII CONSTRUCTION QUALITY ASSURANCE (2%)		\$ 10,000
VIII FINAL CONSTRUCTION REPORT, AS-RECORDED DRAWINGS		\$ 25,000
		<hr/>
SUB-TOTAL ESTIMATED IMPLEMENTATION COSTS		\$ 730,000
IX CONTINGENCIES (30%)		\$ 219,000
		<hr/>
TOTAL ESTIMATED IMPLEMENTATION COSTS		\$ 949,000
		<hr/>

FIGURES



OU1
Alternative
End Use Evaluation

- IGWTP
- Old CrossCut Canal (OCC)
- OCC Discharge Options 1 and 2
- Injection Options 1 and 2

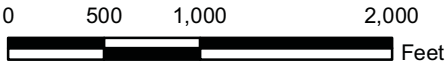


FIGURE 1

OU1 End Use Alternatives

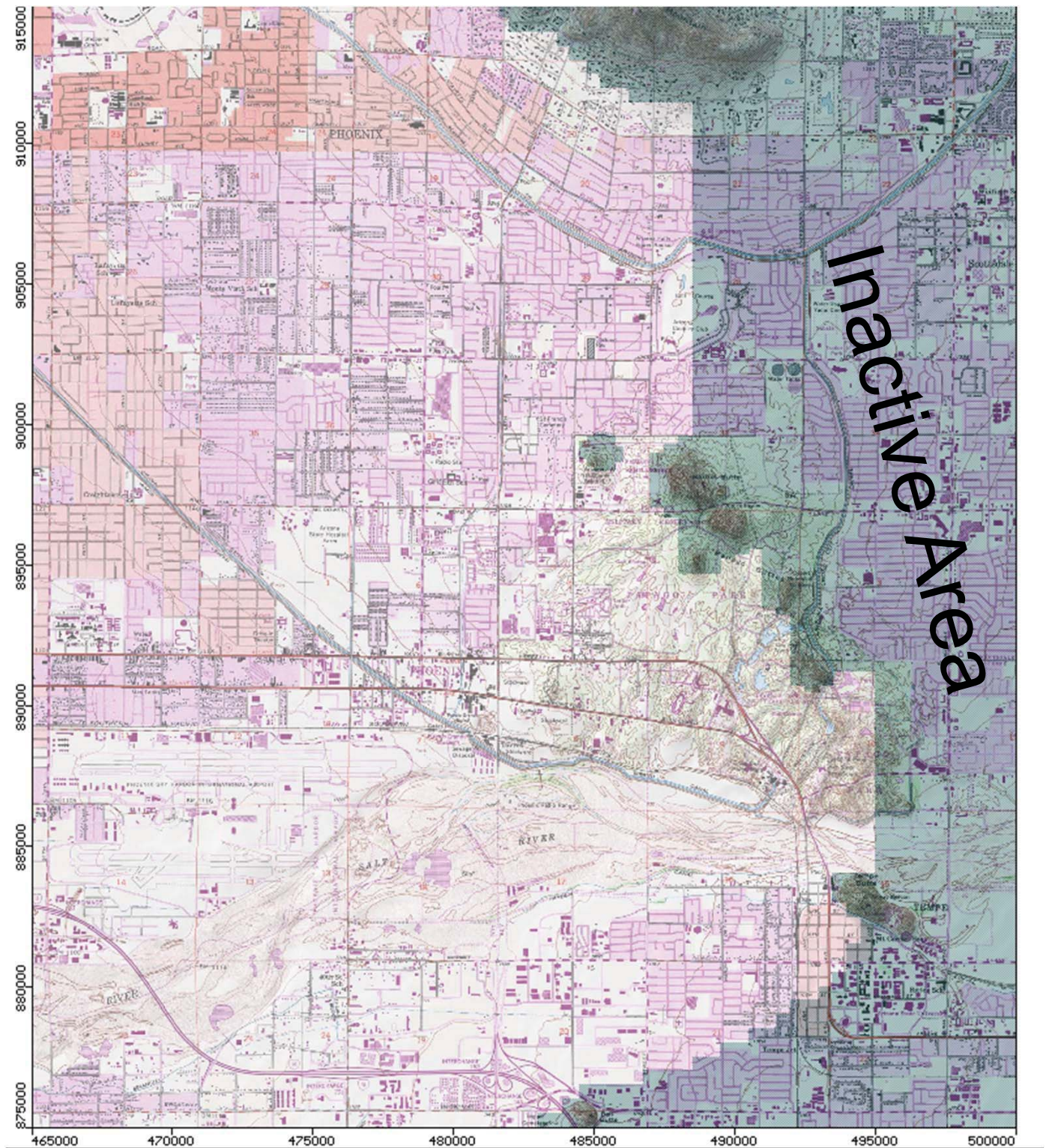
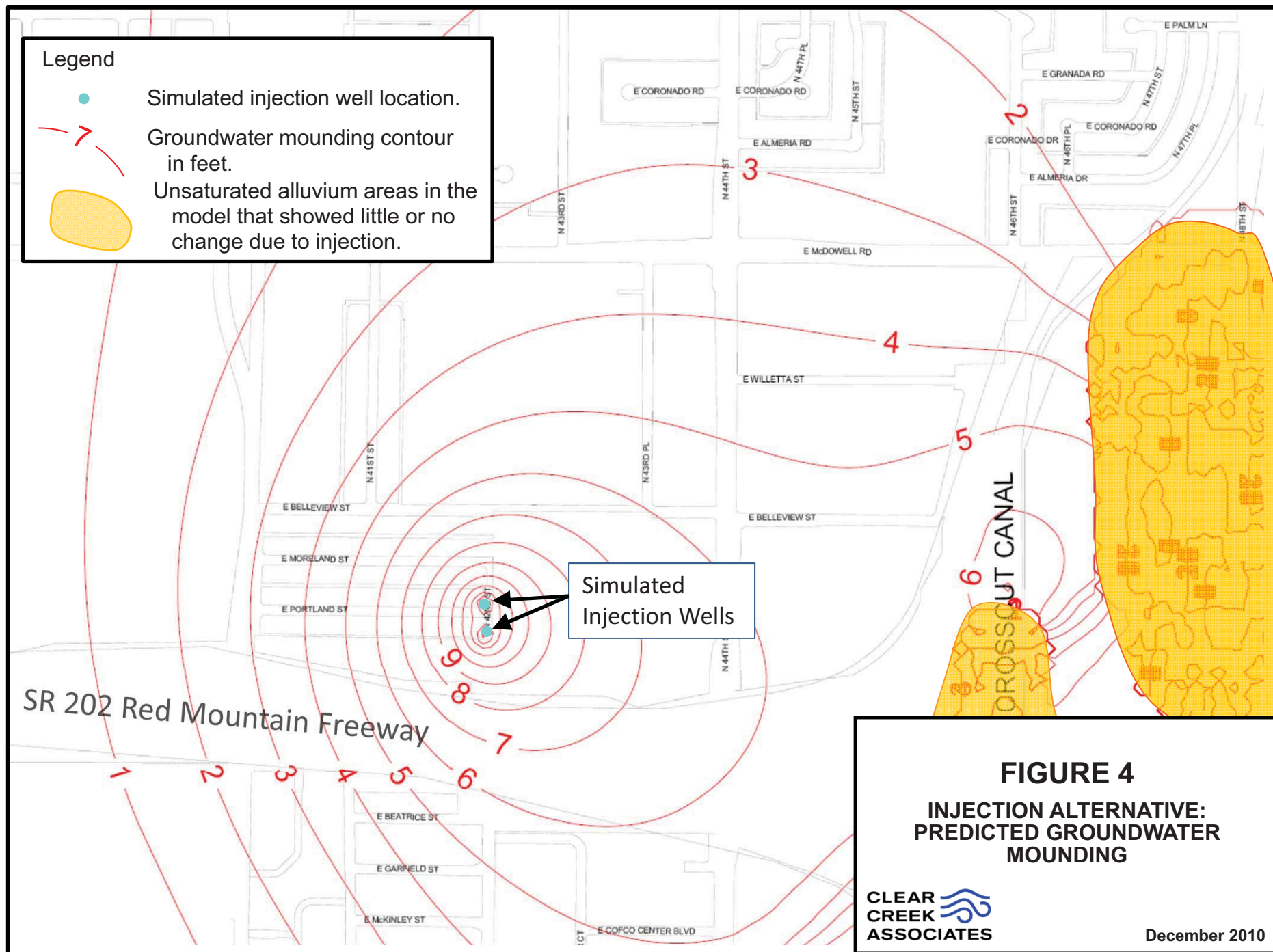
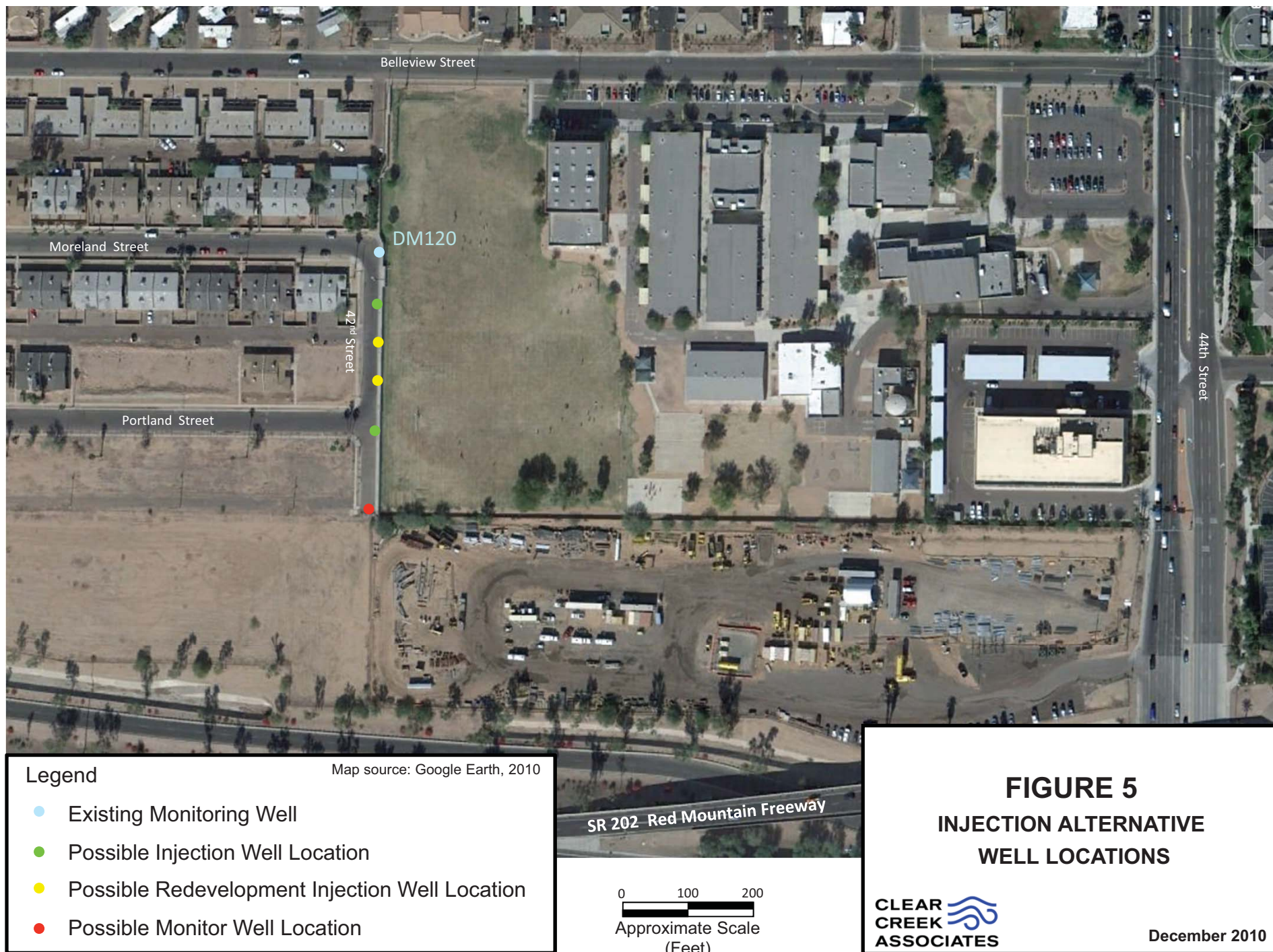


FIGURE 2

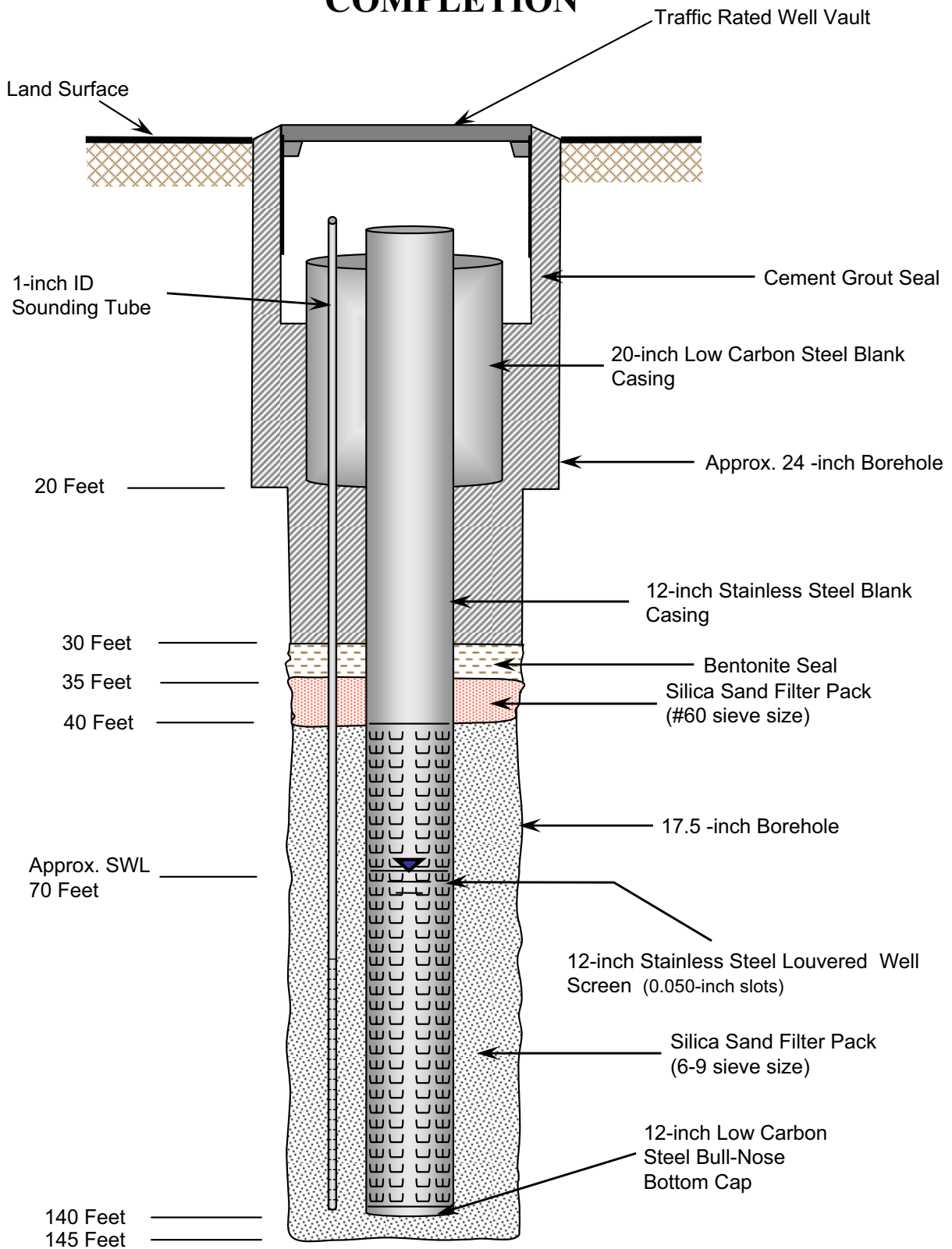
Groundwater Model Domain







AT-GRADE COMPLETION



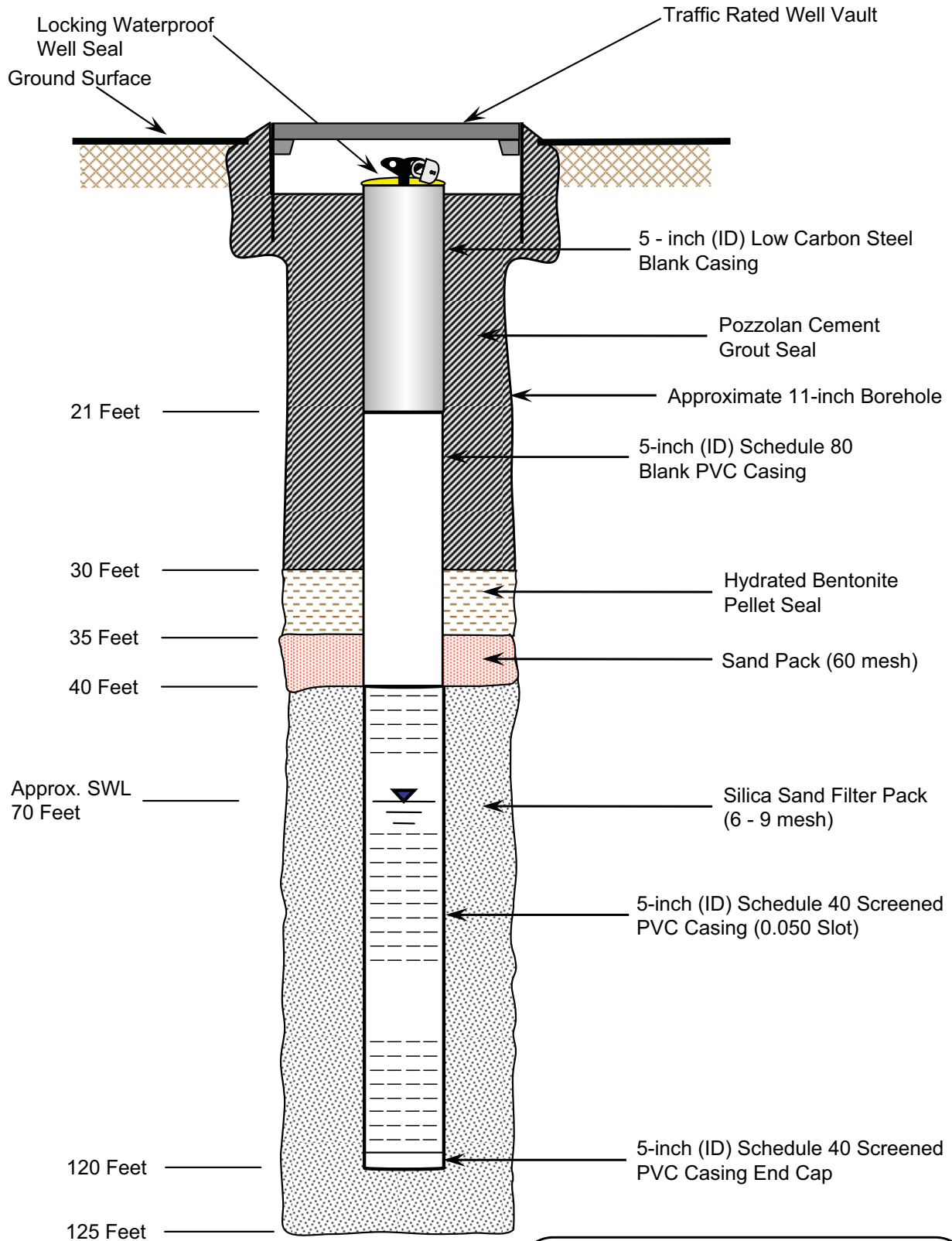
Notes:

SWL = static water level

All diameters OD except well screen which is nominal

FIGURE 6
WELL DESIGN
INJECTION WELL
52nd Street Superfund Site
PHOENIX, ARIZONA

AT-GRADE COMPLETION



Notes:

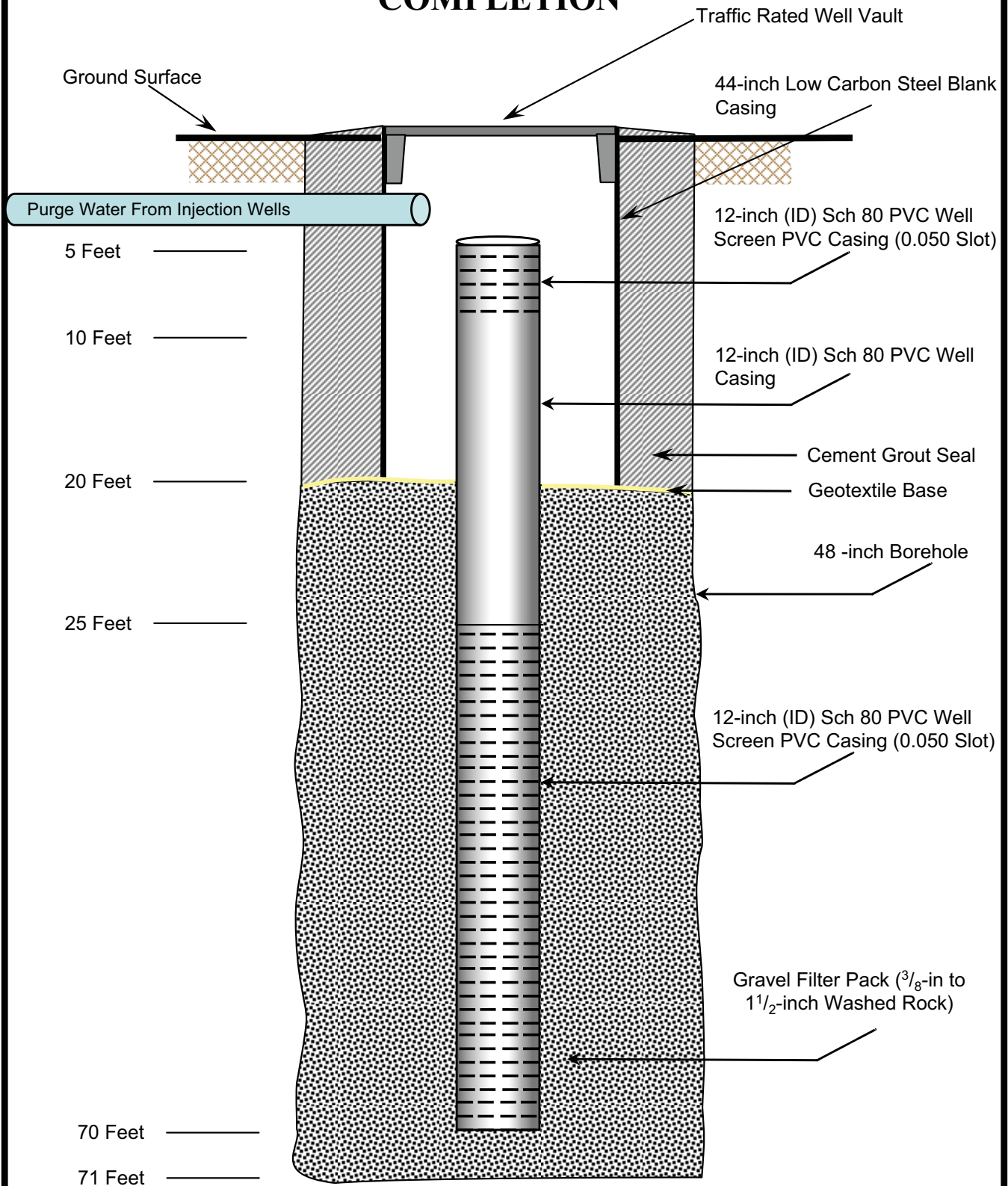
SWL = Static Water Level
ID = Inner Casing Diameter
PVC = Poly Vinyl Chloride

FIGURE 7

WELL DESIGN MONITOR WELL

52nd Street Superfund Site
PHOENIX, ARIZONA

AT-GRADE COMPLETION



Not To Scale

Notes:

SWL = Static Water Level
ID = Inner Casing Diameter
PVC = Poly Vinyl Chloride

FIGURE 8

WELL DESIGN

REDEVELOPMENT INJECTION WELL

52nd Street Superfund Site

PHOENIX, ARIZONA

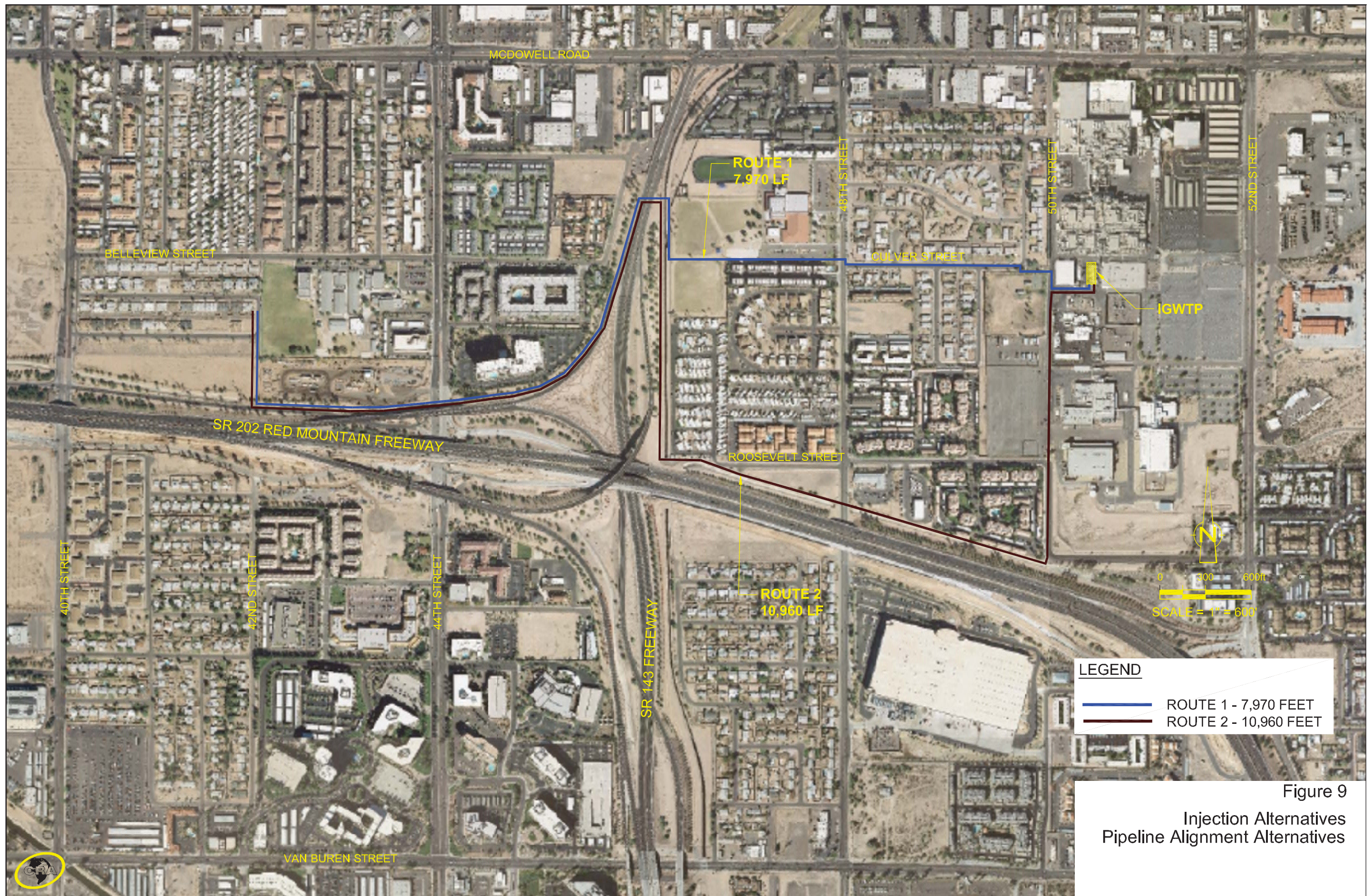
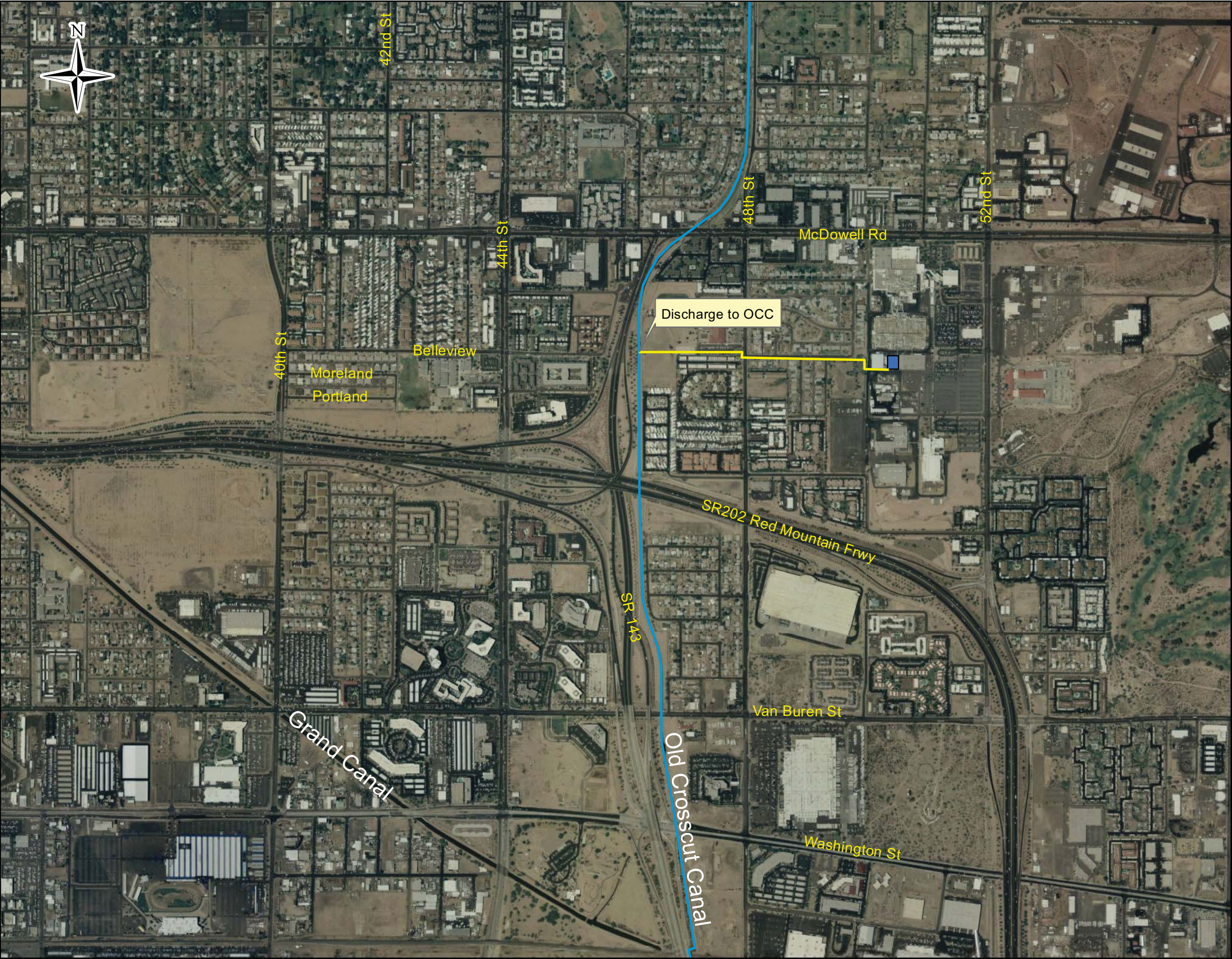


Figure 9
Injection Alternatives
Pipeline Alignment Alternatives



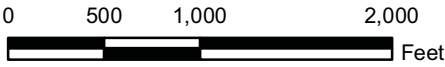
Figure 10
OCC To Grand Canal Discharge Alternatives
Pipeline Alignment Alternatives





OU1
Alternative
End Use Evaluation

- IGWTP
- Old CrossCut Canal (OCC)
- OCC Discharge Preferred Alternative

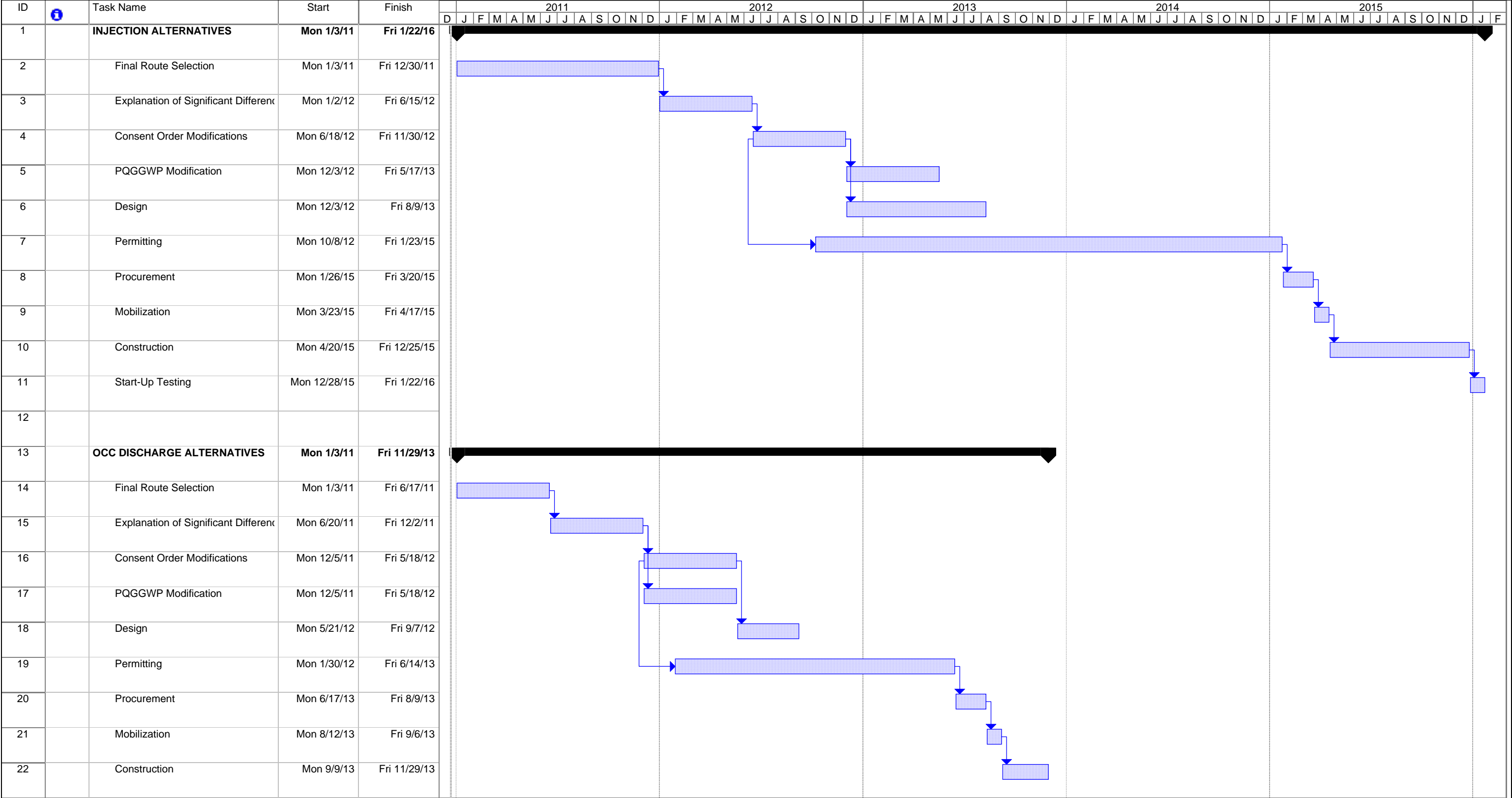


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FIGURE 11
OU1 Preferred Alternative

ATTACHMENTS

ATTACHMENT A



Project: Preliminary Schedule
Date: Wed 12/22/10

Task

Split

Progress

Milestone

◆

Summary

Project Summary

External Tasks

External Milestone

◆

Deadline

↓



Page 1

Final Evaluation Report
End Use Alternatives for Remediated Water
Operable Unit 1Motorola 52nd Street Superfund Site